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Ground-Based Passive Remote Sensing During Fire IFO II

Peter Pilewski and Francisco PJ Valero

NASA Ames Research Center, Moffett Field, CA

During the FIRE Cirrus IFO II, a set of passive radiometers were deployed at the Coffeyville, Kansas, Hub, site B, to compliment the Radiation Measurement System (RAMS) on board the NASA ER-2 and NCAR Sabreliner. The following three instruments were used at the surface:

1. Narrow-field-of View IR Radiometer (NFOV); The NFOV is a $10.5 \mu\text{m}$ ($1 \mu\text{m}$ bandwidth) radiance measuring device, using a liquid nitrogen cooled blackbody reference. Brightness temperature is obtained from the radiance. The NFOV had an 8° field of view and was zenith-pointed.

2) Total-Direct-Diffuse Radiometer (TDDR): The TDDR is a seven channel visible and near-infrared radiometer with rotating shadow bands to separate the direct and diffuse components of the solar flux. The narrow (10 nm) bands are located outside atmospheric absorption bands, isolating the optical effects due to aerosols or clouds. The TDDR was pointed in the zenith direction at site B in Coffeyville, its primary purpose to obtain cirrus spectral optical thickness.

3) Near-Infrared Spectroradiometer (NIRS): The NIRS measures continuous transmission between $0.8 \mu\text{m}$ and $1.8 \mu\text{m}$ with a 10 nm resolution. Near-infrared measurements are very sensitive to microphysics and so are used to infer cloud phase and particle size, along with optical thickness. The NIRS was pointed towards the zenith, and had a 1 mrad field of view.

A time series of reduced surface radiation data is shown in Figure 1 for the November 26, 1991, case study. The upper panel shows the $10.5 \mu\text{m}$ brightness temperature derived from the NFOV. The middle panel shows $0.5 \mu\text{m}$ and $1.64 \mu\text{m}$ optical thickness from TDDR measurements. The lower panel shows the ratio, R , of transmission at $1.64 \mu\text{m}$ to that at $1.25 \mu\text{m}$ (detector response has not been removed) using the NIRS. Methods for deriving cloud properties, such as phase and particle dimension, from these data will be discussed.

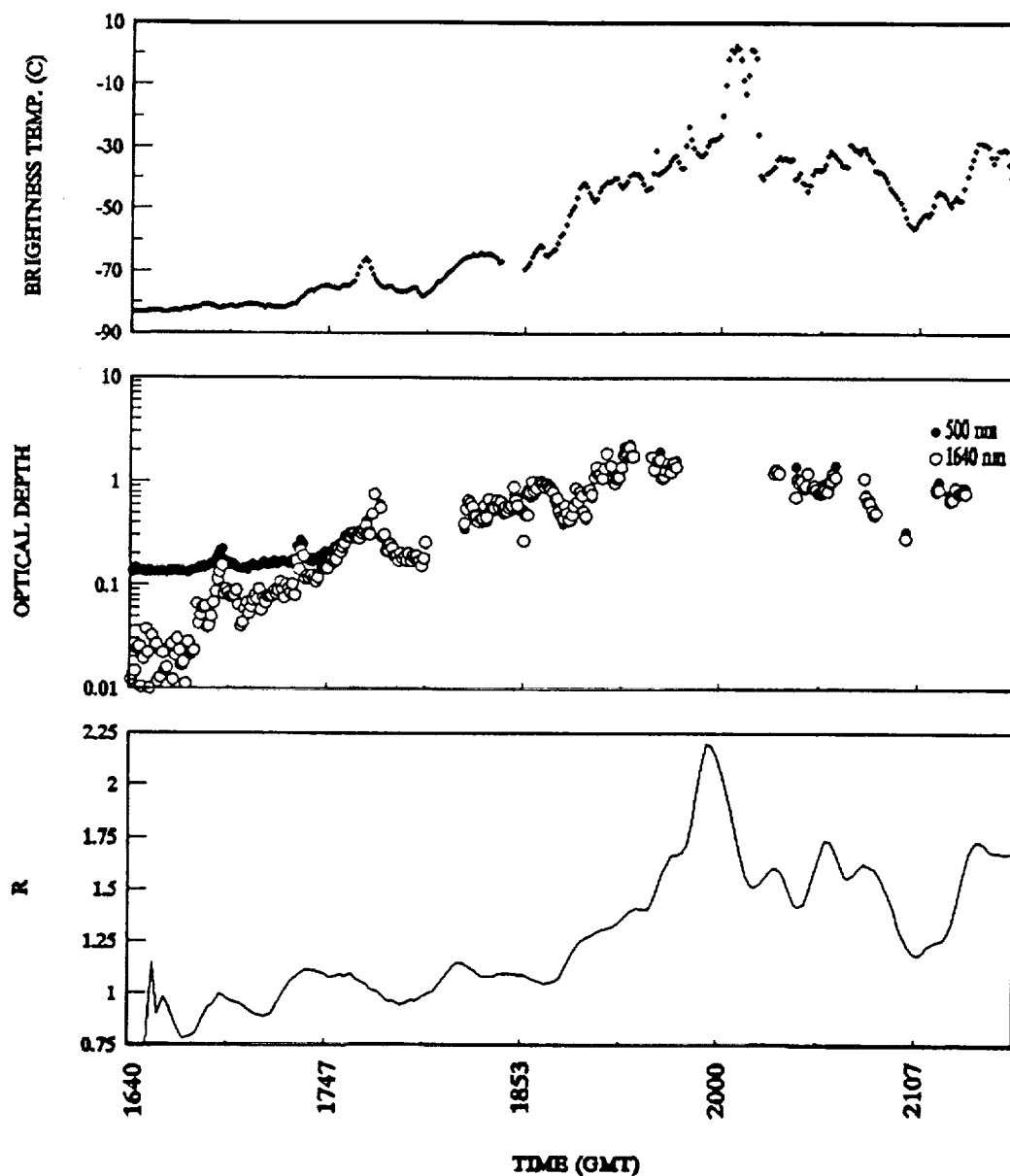


Figure 1. Time series of surface radiation measurements from the Coffeyville Airport Hub, site B, on November 26, 1991. The lower panel shows the ratio of 1.64 μm transmission to 1.25 μm transmission. This quantity is sensitive to both water phase and particle size.